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Digitella rigidophora and *Redbia inflata*, two new microfungi from Mexico

Rafael F. Castañeda-Ruíz[1], Gabriela Heredia[2] & Rosa M. Arias[2*]

[1]*Instituto de Investigaciones Fundamentales en Agricultura Tropical Alejandro de Humboldt, Académico Titular de la "Academia de Ciencias de Cuba", Calle 1 Esquina 2 Santiago de Las Vegas, La Habana, C.P. 17200, Cuba*

[2]*Instituto de Ecología A.C., Carretera antigua a Coatepec 351, Congregación El Haya, 91070 Xalapa, Veracruz, México*

* Correspondence to: *rosy.arias@inecol.edu.mx*

Abstract — Two microfungi collected from plant debris in cloud forests during a survey of the fungi associated with leaf litter in Veracruz are described and illustrated. *Digitella rigidophora* gen. et sp. nov. is distinguished by polytretic conidiogenous cells having a successive sympodial but rectilinear or geniculated proliferation and with discoid to papillate-perforate thickened conidiogenous loci and digitate solitary dark brown to brown conidia. *Redbia inflata* sp. nov. is characterized by alternate, curved to coiled, slightly echinulate branches that possess a distinct ampulla at the ends and by coarsely verruculose, subhyaline, 0–1-septate conidia.

Key words —anamorphic fungi, taxonomy, tropical fungi

Introduction

Tropical mountain cloud forests are among the most diverse biomes in the world. In Mexico, although this kind of forest covers less than 1% of the land surface, it contains 10–12% of the flowering plant species in the country (Rzedowsky 1996). Because of the climatological conditions, all kinds of fungi grow in a wide variety of habitats provided by these forests. Unfortunately, such forests are severely threatened in Mexico. Given that very few mycological studies focused on microfungi have been made in this diverse ecosystem, it is urgent to explore the few areas where there are still remnants of forest. Continuing with a long-term study of anamorphic fungi from tropical mountain cloud forests of central Veracruz State, we sampled fungi in several forest fragments and found two interesting fungi colonizing the rachis of a palm tree and leaves of an unidentified member of the *Lauraceae*. They are described and discussed here.

Material & methods

During a foray to study tropical forest mycobiota, 110 samples of plant litter were collected near the San Martin Tuxtla Volcano (1070 m alt., 18°32′06″N 95°08′25.46.2″W) and Santa Marta, Soteapan (1375 m alt., 18°20′54″N 94°53′23″W). Individual plant samples were placed in paper or plastic bags taken to the laboratory and treated according to the techniques described by Castañeda Ruiz (2005). Mounts were prepared in polyvinyl alcohol-glycerol (8 g in 100 ml of water, plus 5 ml of glycerol) and measurements made at a magnification of ×1000. Photographs were obtained using a Nikon microscope with differential interference contrast (Eclipse E600) and a JEOL (JSM-S600LV) scanning electron microscope (SEM) using the techniques described by Figueras & Guarro (1988).

Taxonomy

Digitella R.F. Castañeda, Heredia & R.M. Arias, **gen. nov.**

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Differs from *Dendryphion* by successive enteroblastic percurrent proliferations after each holoblastic sympodial proliferation of the conidiogenous cells, by discoid to papillate-perforated strongly melanized conidiogenous loci, and solitary digitate brown to dark brown conidia, and differs from *Ceratosporella* by tretic conidiogenous cells.

Type species: *Digitella rigidophora* R.F. Castañeda et al.

Etymology: Latin, *Digitella*, referring to the finger-like conidial branches.

Anamorphic fungi. Colonies on the natural substratum effuse, hairy, dark brown or black. Mycelium partly superficial and immersed. Conidiophores distinct, single, unbranched, septate, dark brown or black, smooth or verrucose. Conidiogenous cells polytretic, integrated, terminal at first with a single terminal conidiogenous locus, then indeterminate, with successive sympodial rectilinear proliferations followed by enteroblastic percurrent proliferation, being the same process repeated several times, producing terminal and intercalary conidiogenous loci. Conidiogenous loci evident, convex, discoid, perforated, thick and black. Conidial secession schizolytic. Conidia solitary, acropleurogenous, digitate, euseptate, brown to dark brown, each with a subconical to somewhat campanulate, conspicuously cicatrized, strongly melanized, subtruncate basal cell.

Digitella rigidophora R.F. Castañeda, Heredia & R.M. Arias, **sp. nov.**

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Differs from *Dendryphion* spp. by successive enteroblastic percurrent proliferations after each holoblastic sympodial proliferation of the conidiogenous cells and solitary digitate brown to dark brown smooth conidia; differs from *Ceratosporella* spp. by tretic conidiogenous cells.

Type: Mexico, Veracruz, San Martin Tuxtla Volcano, on rachis of unidentified palm tree, 5 January 2011, G. Heredia (**Holotype**: XAL CB1692).

Etymology: Latin, *rigidophora*, referring to straight, rigid conidiophores.

Fig. 1. ***Digitella rigidophora*** (ex holotype XAL CB1692). a. Conidia. b. Conidiogenous cells and conidia. c. Conidiogenous locus with a pore (shown by arrow). d. Conidiogenous cells with several enteroblastic percurrent proliferations (shown by arrows). e. Conidiogenous cells and conidiogenous loci (SEM). f. Conidiophore (SEM). g. Conidia (SEM). ***Dendryphion digitatum*** (ex XAL CB1236). h. Conidiogenous cells and conidia. Bars = 10 µm, except where otherwise indicated.

Anamorphic fungus. Colonies on the natural substratum effuse, hairy, dark brown or black. Mycelium partly superficial and immersed. Conidiophores macronematous, mononematous, single, septate, 120–245 × 8–14 µm,

dark brown or black at the base, brown to pale brown at the apex, smooth. Conidiogenous cells polytretic, integrated, 8–11 × 8–12 µm, brown or pale brown, terminal at first with a single terminal conidiogenous locus, then indeterminate, with successive sympodial rectilinear proliferation, sometimes delimited by one septum and followed by enteroblastic percurrent proliferation, being the same process repeated several times, producing terminal and intercalary conidiogenous loci. Conidiogenous loci evident, convex, discoid, papillate-perforated, 5–7 µm diam., thick and black. Conidial secession schizolytic. Conidia solitary, acropleurogenous, digitate, euseptate, constricted at septate when mature, brown to dark brown, 49–78 × 23–26 µm, composed of two branches, 43–75 µm long and a subconical to somewhat campanulate, conspicuously cicatrized, strongly melanized, subtruncate basal cell, 8–10 µm wide. Teleomorph unknown.

Comments — The pattern of ontogeny in *Digitella* can be classified using the scheme for conidial development in Kirk et al. (2008). Conidial initiation is tretic, delimitation by 1 septum, secession schizolytic, maturation by diffuse wall-building, percurrent enteroblastic conidiogenous cell extension, followed by further conidial initiation by replacement of apical wall-building; strongly melanized, each successive conidium seceding before the next percurrent elongation of the conidiogenous cell, but sometimes also holoblastic, sympodial proliferation occurring, with two or more conidia produced. The combination of sympodial and enteroblastic percurrent proliferations with discoid, convex, thick, darkened conidiogenous loci in *Digitella* separates it from *Dendryphion* Wallr. (Bhat & Sutton 1985, Ellis 1971, 1976, Hughes 1978, Siboe et al. 1999), where dark cicatrized loci are produced after sympodial proliferations of the discrete, polytretic conidiogenous cells disposed in geniculate branches of the conidiophores (e.g., *Dendryphion digitatum* Subram., Fig. 1h). *Dendryphion* conidia are solitary or very often short catenulate and only digitate or cheiroid in few species. *Ceratosporella* Höhn. species also have digitate to cheiroid conidia similar to *Digitella*, but the conidium ontogeny in *Ceratosporella* is holoblastic and only enteroblastic percurrent proliferations occur during the conidiogenous events.

Redbia inflata Heredia, R.M. Arias & R.F. Castañeda, **sp. nov.** Fig. 2

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Differs from *Redbia elegans* by curved to sub-coiled branches; swollen to botryose conidiogenous cells and 0–1-septate, oblong to cylindrical conidia, which sometimes bear secondary conidia at the apex.

Type: Mexico, Veracruz, Soteapan, Reserva de la Biosfera de la Sierra Santa Marta, on decaying leaf of an unidentified species of the *Lauraceae*, 5 August 2011, G. Heredia (**Holotype**: XAL CB1691).

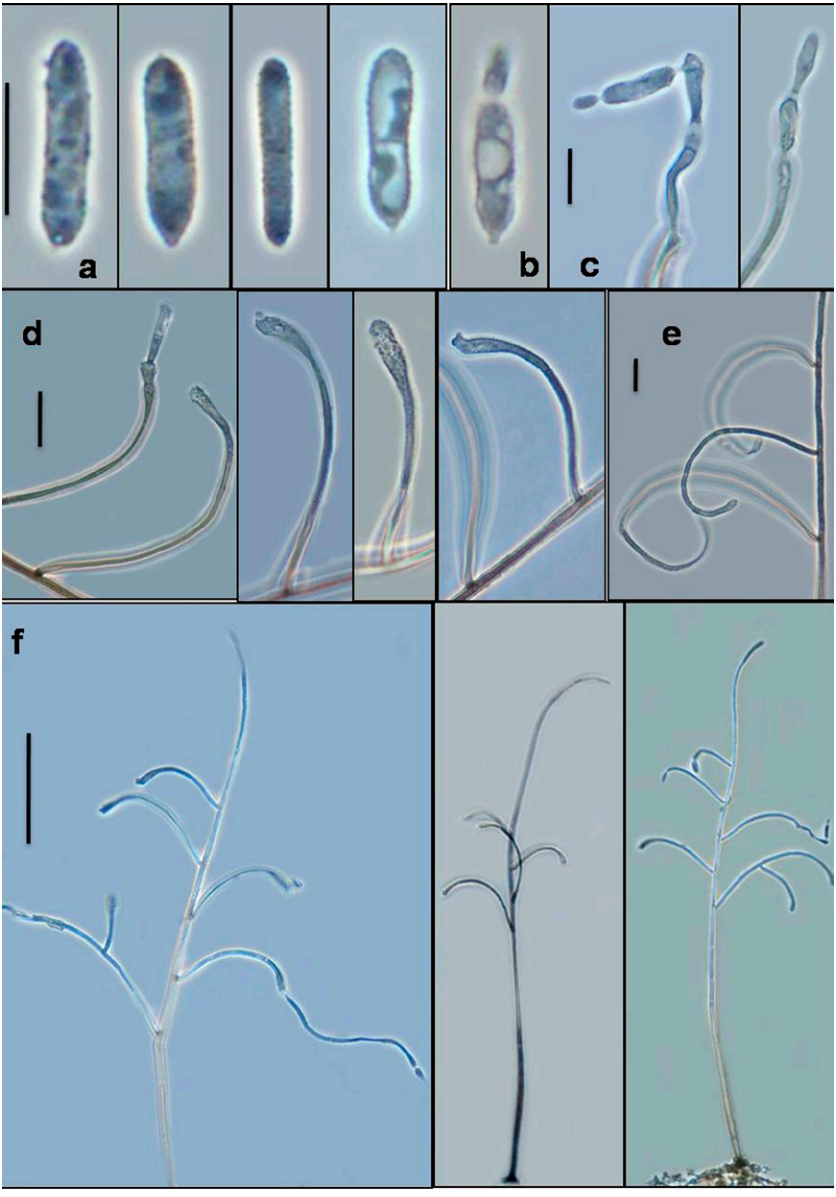

Fig. 2. ***Redbia inflata*** (ex holotype XAL CB1691). a. Conidia. b. Catenulate conidia. c. Conidiogenous cells and conidia. d, e. Branches. f. Conidiophores. Bars a, c = 10 µm; d, e = 40 µm; f = 100 µm.

Etymology: Latin, *inflata*, referred to the vesicular swellings at the tips of branches.

Colonies on the natural substratum, effuse, hairy, brown. Mycelium superficial and immersed. Hyphae septate, branched, 1–2 µm diam., smooth, pale brown to brown. Conidiophores macronematous, mononematous, erect, straight, cylindrical 14–19-septate, smooth at the base, verruculose to verrucose towards the apex and branch tips, 480–600 × 12–17 µm, alternately branched, with branches whip-like, curved, slightly coiled, brown at the base and subhyaline 94–200 µm long, echinulate, with an ampulla or a botryose to inflated apex 5–7 µm wide. Conidiogenous cells polyblastic, denticulate, terminal, integrated and discrete, subhyaline, 6–20 × 5–8 µm, indeterminate, with several sympodial proliferations bearing conspicuous denticles. Conidial secession schizolytic. Conidia solitary or sometimes short catenulate, oblong to somewhat cylindrical, coarsely verruculose to verrucose, obtuse or rounded at the apex, truncate at the base, 0–1-septate, 12–16 × 2.5–3.5 µm, subhyaline, dry. Teleomorph unknown.

Comments — Deighton & Pirozynski (1972) established *Redbia* based on a mycophilous fungus, *R. pucciniicola* (the type species), found on telia of *Puccinia holosericea* Cooke. *Redbia* is distinguished by conidiophore branches, brown below and paler towards the apex and branches, with sympodial proliferating, denticulate conidiogenous cells. Three additional species were described: *R. elegans* Piroz. & Hodges (Pirozynski & Hodges 1973), *R. laxa* R.F. Castañeda (Castañeda 1985), and *R. trichomambusta* R.W. Barreto (Barreto1994). *Redbia inflata* is superficially similar to *R. elegans* in conidial ornamentation, but *R. elegans* is easily differentiated by its narrow ellipsoid to fusiform, 3-septate, 15–35 × 4–5 µm conidia.

Key to Redbia species

1 Conidiophores simple, conidia obovate, 0–3-septate, 8–21 × 1–6 µm, smooth, pale brown ..... *R. trichomambusta*
Conidiophores branched 2

2 (1) Conidia smooth 3
Conidia verruculose 4

3 (2) Conidia fusiform, 1–3-septate, hyaline, 10–21 × 3–4.5 µm ..... *R. pucciniicola*
Conidia obovoid to clavate, 1-septate, sometimes unequal, hyaline or subhyaline, 7.5–10.5 × 3–3.5 µm ..... *R. laxa*

4(2) Conidia narrowly ellipsoid or fusiform, pale straw-colour, 3-septate, 15–35 × 4–5 µm ..... *R. elegans*
Conidia oblong to somewhat cylindrical, subhyaline, 0–1-septate, 12–16 × 2.5–3.5 µm ..... *R. inflata*

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